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Proposed electronic postage system features 2D code

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Better security and SOHO market targeted by postal service

LYNNE BRAKEMAN, CONTRIBUTING EDITOR

A proposed new postage metering system under development by the United States Postal Service (USPS) and postage meter manufacturers would use two-dimensional bar codes for security and tracking. The draft specifications for the Information-Based Indicia Program (IBIP) were issued last June for comment by the industry. 'Indicia' is the formal term for a postage mark, be it a stamp or a postage meter imprint. The Postal Service is migrating to a new metering system to stem an estimated \$150 million in revenue lost to fraud.

As originally drafted, the specifications called for a PC-based system that uses a standard printer to print a PDF417-symbology code that will encrypt both the address information and the postage value. However, a USPS spokesperson admits that the final form of the indicia is not yet determined.

Roy Gordon, IBIP program manager for USPS, is charged with receiving and evaluating the 'concept of operation' proposals from various manufacturers vying to develop the proposed system to their advantage. At press time, no proposed system had yet been accepted for alpha- or beta-testing by the USPS. 'It's all vaporware until I see the product,' said Gordon. 'But I anticipate actually receiving products to start alpha testing in the very near future. We could be beta testing some of these systems by summer.' Gordon said he had received only two complete 'concept of operation' proposals.

The development of so-called PC-based metering, originally proposed by USPS at a sparsely-attended public meeting in May 1995, has been hastened by the Service's announcement in May 1996 that all mechanical postage meters must be withdrawn from use by March 1, 1999, in a process called 'decertification.' The timetable for decertifying specific mechanical postage meters varies according to the size of the mailer and the type of

8/30/00 9:02 AM

postage - meter being used.

\$150 million in losses  
Decertification is a result of a 1994 Government Accounting Office (GAO) report that alerted Congress to postage meter fraud that some sources say accounts for up to \$150 million in lost revenue to the USPS every year.

There are currently 1,518,800 postage meters in use. About 52% of those are mechanically-based. Decertification is widely viewed as an opportunity to create the next generation postage meter, incorporating digital printing and address encryption for security with the ability to download postage value from the USPS over the Internet.

Kate Muth, who, as editor of the Business Mailers Review (BMR) has closely followed the development of IBIP, said, 'I think a lot of people understand why the postal service is heading in this direction. They need more secure metering. The technology is very interesting and it's really going to open up the market to some more players.'

Muth said the postage meter market has been dominated by four players for the last 20 years: Pitney-Bowes (which created the first postage meter in 1920), with an 85% market share; Neopost; Francotyp-Postalia and Ascom-Hasler. Historically, these four companies have concentrated on large corporations and volume mailers. So, although there are more than 12 million businesses in the United States, there are only 1.5 million postage meters. BMR estimates there are approximately six million small office/home office (SOHO) mailers in the U.S.

'Now, with PC-based postage, new companies like E-stamp are looking to tap into a whole new market base. That's where people see an exciting opportunity,' said Muth. [see sidebar for postage meter manufacturers' comments]

'IBIP could potentially have a bigger impact on stamp usage than postage meters,' said Gordon. 'It appears that some of the products under development are being targeted toward the SOHO market. We are initiating customer focus groups and studies with that market to see what the reaction to this technology would be.'

The comment period for the first draft IBIP specifications ended last November. The USPS received hundreds of comments from the industry and is unsure when the second draft specification will be issued. After a 90- to 120-day comment period, a final specification will be issued. But that process may take more than a year to reach a conclusion, said Gordon.

There are some limitations to the proposed system, particularly with respect to volume mailers.

The address must be printed at the same time as indicia, because the encryption of the 2D code is based on the address. Therefore, the system won't work with a window envelope, an envelope with a preprinted address or a handwritten address.

PC printers may have trouble handling pre-stuffed envelopes.

The proposed system requires verification of mailing addresses using a CD-ROM supplied and updated quarterly by USPS. If the CD-ROM does not verify an address, the mailer will need to use a stamp.

Non-disclosure agreements prohibit Gordon from saying which companies had submitted working concepts. AUTOMATIC I.D. NEWS determined the two companies farthest along in the development process seem to be the Houston-based upstart E-stamp, and industry heavyweight Pitney-Bowes. Representatives of Neopost and Francotyp-Postalia indicated they were involved in the process, but are biding their time until a more definitive specification is released. A representative from Ascom-Hasler had not returned AUTOMATIC I.D. NEWS' phone calls at press time.

The bottom line

While many parties to the competition remain somewhat tight-lipped about their progress, it is clear that all accept some form of PC-based postage metering system will soon be a reality. Except for enthusiastic E-stamp, the four existing postage meter companies seem to be grimly girding themselves for a major retooling of their industry.

USPS' Gordon says everything's up for grabs, as the Postal Service

8/30/00 9:02 AM

4

means to generate a control value dependent upon the value stored in said register and to include a code value dependent upon the control value in an indicium printed on a mail item.

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#### BRIEF DESCRIPTION OF THE DRAWINGS

An embodiment of the invention will be described by way of example with reference to the drawings in which:-

Figure 1 is a block diagram of a postage meter

10 Figure 2 illustrates machine information included in an indicium printed on a mail item,

Figure 3 is a flow chart illustrating steps carried out in generating authentication information to be printed in the indicium

15 Figure 4 is a flow chart illustrating steps in authenticating a printed indicium and

Figure 5 is a flow chart illustrating additional or alternative steps carried out in printing a postage indicium.

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#### DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring first to Figure 1 of the drawings, the postage meter includes electronic accounting and control means comprising a micro-processor 10 operating under program

25 routines stored in a read only memory (ROM) 11. A keyboard 12 is provided for input of commands and data by a user and a display 13 is provided to enable display of information to the user. A random access memory (RAM) 14 is provided for use as a working store for storage of

30 temporary data during operation of the postage meter.

Non-volatile duplicated memories 15, 16 are provided for the storage of critical data relating to use of the postage meter and which is required to be retained even when the postage meter is not powered. The microprocessor

35 10 carries out accounting functions in relation to use of the postage meter for franking mail items with amounts of postage charges applicable to handling of the mail items

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by the postal authority or another carrier. Accounting data relating to use of the postage meter for printing franking indicia representing postage charges for mail items and any other critical data to be retained is stored in the non-volatile memories 15, 16. The accounting data includes a value of credit, an accumulated total of value used by the meter in franking mail items, a count of the number of mail items franked by the meter and a count of the number of mail items franked with a postage charge in excess of a predetermined value. The value of credit may be a value of credit available for use by the meter and stored in a descending credit register. The accumulated total value used by the meter is stored in an ascending tote register, the count of items is stored in a piece count register and the count of items franked with a postage charge in excess of a predetermined value is stored in a large items register. Alternatively, if desired, instead of a descending register storing a value of credit available for use by the meter, a total value of credit entered into the meter may be stored in an ascending credit register.

As is well known in the postage meter art, each of the registers referred to hereinbefore for storing accounting data is replicated in order to enable integrity of the accounting data to be maintained even in the event of a fault or termination of power to the meter during a franking operation. Two replications of each of the registers are provided in each of the memory devices 15, 16.

A motor controller 17 is controlled by the microprocessor 10 to control operation of motors 18 driving feeding means (not shown) for feeding a mail item past a digital print head 19. The digital print head 19 may be an impact print head in which print elements are impelled selectively to impact with an ink ribbon to transfer ink to a mail item

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or any other form of digital print head and for example may be a non-impact print head. It is preferred to use a non-impact print head such as a thermal print head operating as described hereinafter. The thermal print head includes a plurality of selectively energisable thermal printing elements 20. Sensors 21 are provided to sense and monitor feeding of the mail item. The sensors provide signals to the microprocessor to enable the microprocessor to control feeding of the mail item and to energise selectively the thermal print elements 20 of the print head at appropriate times as the mail item is fed past the print head. As the mail item is fed past the thermal printing elements 20 of the print head 19 during a printing operation, the microprocessor outputs on line 22, in each of a series of printing cycles, print data signals selecting those ones of the printing elements 20 which are to be energised in each respective printing cycle. A pulse of electrical power is supplied to the selected thermal printing elements from a power source 23 when a strobe signal is supplied by the microprocessor on a line 24 to the print head. When printing a bar-code, a plurality of adjacent thermal printing elements are energised in selected printing cycles such as to print narrow and wide bars as required to represent data. The bars may all be of the same length in which case the same number of thermal printing elements are energised in each of the selected printing cycles. However when it is desired to print bars of selected different lengths, the number of thermal printing elements energised in each selected printing cycle is selected to correspond to the required length of bar to be printed.

It will be appreciated, as is well known in the postage meter art, that the postage meter must operate in a secure manner and be protected from attempts to use the meter fraudulently for example by utilising the postage meter to print franking indicia on mail items for which no

corresponding postage charge has been accounted for by the accounting means. Accordingly those parts of the postage meter required to be secured against unauthorised tampering are housed in a secure housing 28.

5 In so-called prepayment operation of a postage meter, each time a franking operation is to be performed, the micro-processor carries out a routine in which a determination is made as to whether the value of credit in the credit  
10 register is sufficient to permit the franking operation in respect of the required postage charge for a mail item to be performed. If the value of credit in the credit register is sufficient, the franking operation is continued and the accounting data in the registers is  
15 updated to account for the postage charge and the franking indicia is printed. However if the value of credit in the credit register is not sufficient to permit the franking operation in respect of the required postage charge to be performed, the operation is terminated and the franking  
20 indicia is not printed. Where a value of credit available for use in franking is stored in a descending register, the check as to sufficiency of the credit available is effected by a determination of whether the postage charge is less than the credit value. Where a total value of  
25 credit is stored in an ascending credit register the check as to sufficiency of credit is effected by a determination of whether the total value of credit is at least equal to the sum of the postage amount and the accumulated total value in the tote register.

30 In addition to the security against fraudulent attempts to print postage indicia on mail items provided by the secure construction of the postage meter, additional security in respect of the postage indicia and for the postage amounts  
35 represented is provided by authentication data included in the indicia. The authentication data to be printed in the indicia is encrypted. The postage data together with the

encrypted authentication data information is printed on the mail item. The encryption of the data is effected using an algorithm and a secret key so that the encrypted information is not predictable from the data printed in the indicia. The validity of an indicium can be verified by carrying out the same encryption of the printed data and then comparing the resultant encrypted information with the encrypted information printed on the mail item. If the comparison is successful validity of the indicium is verified whereas if the comparison is not successful the indicium is regarded as not authentic. The process for generation of the encrypted information, if desired, may be a reversible encryption process whereby the encrypted information can be decrypted to yield the original data. When a reversible encryption process is used, verification of the indicium may be effected by decrypting the encrypted information printed in the indicium and comparing the decrypted information with the original data. Instead of utilising encrypted information for verification of the authenticity of the indicium a digital signature may be used.

To facilitate verification of the validity of the indicia it is desirable that the data and encrypted information or digital signature in the indicia is of a form which is machine readable. Accordingly the mail items can be fed through reading means to scan the indicia on the mail items and computing means coupled to the reading means carries out verification checks on the scanned indicia. Conveniently the postage data and encrypted authentication data are printed in a form suitable for optical character recognition or may be printed in the form of a bar-code. In addition to the machine readable information, the indicium may contain information in human readable form.

Referring now to Figure 2 of the drawings, the figure illustrates an example of a format of postage data items

and encrypted information in a machine readable part of an indicium. The machine readable part of the indicium includes postage data comprising a meter vendor's or meter manufacturer's identification 30 provided by a single digit, a postage meter identification 31 provided by six digits, a piece count 32 of the number of mail items processed by the postage meter provided by five digits, a date representation 33 provided by a single digit, a postage amount 34 represented by a single digit and also includes a mail authentication code 35 of two digits comprising an encryption of authentication data. If desired the order of the items of data ~~and~~ may be changed and the encrypted authentication data 35 may be a digital signature instead of encrypted information. The representation of date by a single digit and the representation of postage amount by a single digit is described in our pending application GB 9623936.3. The '\*' symbols are used in the figure to separate the various items of data in the indicia. However in practice if desired these symbols may be omitted or replaced by other means the only requirement being that each data item can be distinguished from a neighbouring data item.

Referring to the flow chart of Figure 3, the microprocessor of the postage meter reads (step 40) a secret key stored in the non-volatile memory 15, 16 and then modifies the secret key in a modification process. The modification of the secret key is effected in dependence upon a code generated (step 41) from data to be printed in the machine readable part of the indicium. A code number which may be a check digit or check digits is generated (step 41) from at least a part of the postage data and the code number is utilised in conjunction with an algorithm or look-up table to generate (step 42) a modified secret key. Thus the modified secret key will be unpredictable for each mail item and will vary in a random manner dependent upon the postage data. The modified



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secret key is then utilised (step 43) with an algorithm to operate on at least a part of the postage data to generate the machine authentication code. Then an indicium containing the postage data and authentication code is  
5 printed (step 44) on the mail item and the routine in respect of that mail item ends (END 45).

Referring to the flow chart of Figure 4, when the mail item bearing a postage indicia including the machine  
10 readable part is received by a postal authority, the machine readable data is read (step 50) by a machine reading device such as a scanner and the output of the scanner is input to a postal authority computer. The computer utilises (step 51) the vendor identification 30  
15 and the postage meter identification 31 to access a look-up table to determine the secret key appropriate to the postage meter that printed the indicia on the received mail item. The computer then modifies the secret key in dependence upon a code generated in dependence upon the  
20 postage data read from the mail item, in the same manner as the postage meter generated the modified secret key, to generate a modified key corresponding to the modified secret key generated by the postage meter. Thus the computer generates (step 52) the code from the postage  
25 data and utilises the code to generate (step 53) the modified secret key. The computer then utilises (step 54) the modified secret key with an algorithm to operate on the code generated from the postage data, in the same manner as the postage meter, to generate the mail  
30 authentication code 35. The computer then compares (step 55) the authentication code generated in step 54 with the authentication code read from the mail item. If the mail authentication code generated by the computer corresponds (YES output of step 56) to the mail authentication code  
35 read in the machine readable part of the indicia printed on the mail item the postage indicia is authenticated and is genuine and the mail item is accepted (step 57). The

11

authentication of the indicium for that mail item then ends (END 58). However if the mail authentication code generated by the computer does not correspond (NO output of step 56) to the mail authentication code read from the indicia, the indicia is not authenticated and is not genuine. The computer then operates to reject (step 59) the mail item as bearing an indicia which has been printed in a fraudulent manner and checking authentication of the indicium on that mail item ends (END 58). It will be appreciated that if the postage meter utilises only a part of the postage data to generate the code to modify the key and only a part of the postage data to generate the authentication code, the computer utilises the same part or parts of the postage data in generating the code to modify the key and to generate the authentication code.

Instead of modifying the key as described hereinbefore, or in addition to modifying the key, the data printed in the machine readable part of the indicium may include a control value dependent upon the accumulated value in the ascending register of postage dispensed by the meter and the credit value in the credit register and, for example, the control value may be dependent upon the sum of the accumulated value and the credit value. The control value may be equal to the sum of the accumulated value and credit value or may be derived from this sum. A routine, or a sub-routine to be incorporated in the routine illustrated by Figure 3, for printing an indicium containing a control value is illustrated by the flow chart of Figure 5. After initiation (START 60) of the routine or sub-routine, the control value is generated (step 61) and the indicium is printed (step 62), the indicium containing the control value. If desired, where the steps of Figure 5 are a sub-routine, the sub-routine may be carried out between steps 43 and 44 of the flow chart of Figure 3.

12

The postage meter may be provided with registers in the non-volatile memories 15, 16 which store monthly totals of postage dispensed by the meter. For example, there may be two such registers, one storing the amount of postage  
5 dispensed to date in a current period and which will continue to be incremented as postage is dispensed until the end of the current period and the other register storing the amount of postage dispensed in the period immediately preceding the current period. The start and  
10 finish of each period is determined by a real time clock 29 communicating with the microprocessor 10. Conveniently each of the periods may be equal to one month. Instead of the control value being dependent upon the sum of the accumulated tote value and the credit value, the control  
15 value may be dependent upon the values stored in one or both of these two registers. For example the control value may be a check digit relating to the register storing the postage value dispensed in the preceding period or may be a range indicator related to an amount of  
20 postage predicted to be dispensed by the postage meter. The range indicator may be based on the amount of postage dispensed in the preceding period.

It is preferred that the indicia printed on the mail item  
25 contains all the postage data required to enable authentication of the indicia at the postal authority. However, postage meters are subject to inspection at predetermined intervals either by physically taking the meter to the postal authority or by remote inspection via  
30 a communication link and in the course of such inspections data is read from the registers of the meter. Accordingly one or more items of postage data additional to those included in the postal indicia printed on the mail item may be communicated to the postal authority during each  
35 said inspection of the postage meter and these additional items of data may be utilised by the postal authority computer in authentication of the indicia printed on the

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mail items.

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